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REMARKS

Applicants concurrently file herewith and Excess Claim Fee Payment Letter for one (1) excess total claim.

Claims 1, 3-24 and 26-30 are all of the claims presently pending in the application. Claims 1, 24 and 27 have been amended to more particularly define the invention. Claim 2 has been canceled without prejudice or disclaimer. New claims 28-30 have been added to provide more varied protection of the claimed invention. New claims 28-30 merely recite features that were recited in previously pending claims, therefore they do not add new subject matter that would require further search and/or consideration by the Examiner.

Entry of this Amendment is believed proper since no new issues are being presented to the Examiner, which would require further consideration and/or search.

It is noted that the claim amendments are made only for more particularly pointing out the invention, and not for distinguishing the invention over the prior art, narrowing the claims or for any statutory requirements of patentability. Further, Applicants specifically state that no amendment to any claim herein should be construed as a disclaimer of any interest in or right to an equivalent of any element or feature of the amended claim.

Claims 1, 3, 7, 8, 10-18, 24, 26 and 27 stand rejected under 35 U.S.C. § 103(a) as being anticipated by Tadayon et al. (U.S. Patent No. 6,574,963) (hereinafter "Tadayon") in view of Bhatia et al. (U.S. Patent No. 5,921,087; hereinafter "Bhatia"). Claims 4-6 and 20-23 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Tadayon in view of Bhatia and further in view of Thiesen et al. (U.S. Patent No. 6,595,006) (hereinafter "Thiesen") or, as an alternative, Chrysler et al. (U.S. Patent No. 5,303,555) (hereinafter "Chrysler") or Hill (U.S. Patent No. 5,924,305).

These rejections are respectfully traversed in the following discussion.

I. THE CLAIMED INVENTION

The claimed invention (e.g., as defined by exemplary claim 1) is directed to an assembly including at least one microprocessor.

The microprocessor includes means for recycling heat, generated by at least one

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microprocessor to mechanical energy, and means for directing the heat from the at least one microprocessor to the means for recycling heat. The mechanical energy is directly used for cooling the at least one microprocessor.

The claimed invention of exemplary claim 1 provides an assembly including at least one microprocessor that includes means for recycling heat generated by at least one microprocessor to mechanical energy, wherein the energy is directly used for cooling the at least one microprocessor (e.g., see Application at page 3, lines 14-20). The claimed invention provides an assembly that suitably improves the power efficiencies of computer systems (see Application at page 3, lines 10-13).

II. THE 35 USC §112, FIRST PARAGRAPH REJECTION

Claim 9 stands rejected under 35 U.S.C. § 112, first paragraph. Specifically, the Examiner states that the “means for recycling heat by a chemical reaction has not been disclosed in the specification”. Applicants respectfully submit that the Applicant provides as an example for a means for energy-recycling of the heat that “the heat from the chip can drive a chemical reaction, which is used to store energy” (see Application at page 13, lines 19-23). Applicants respectfully submit that the claim limitation of claim 9 is clearly disclosed in the specification with enough specificity to enable one or ordinary skill in the art to make and/or use the invention.

In view of the foregoing, reconsideration and withdrawal of the §112, first paragraph rejection is respectfully requested.

III. THE PRIOR ART REFERENCES

A. The Tadayon Reference

Applicants submit that Tadayon does not teach or suggest an assembly including at least one microprocessor “*wherein said mechanical energy is directly used for cooling said at least one microprocessor*” as recited in claim 1 and similarly recited in claims 24 and 27.

The Examiner attempts to rely on column 3, lines 1-3 of Tadayon to support his allegations. The Examiner, however, is clearly incorrect.

That is, nowhere does Tadayon teach or suggest an assembly including at least one

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microprocessor that includes means for recycling heat generated by at least one microprocessor to energy, wherein the mechanical energy is directly used for cooling the at least one microprocessor. Indeed, the Examiner does not even allege that Tadayon teaches or suggests this feature. In fact, the Examiner concedes that Tadayon does not teach or suggest this feature (see Office Action dated February 18, 2005 at page 2, numbered paragraph 2).

Tadayon merely discloses an electrical energy-generating heat sink system that provides a method for continuously recharging an energy storage device in electronic devices. That is, Tadayon merely teaches storing energy in the form of electrical energy to charge a battery.

In contrast, the claimed invention uses recycled mechanical energy for directly cooling the microprocessor chip. This allows the assembly, in some cases, to avoid converting mechanical energy into electrical energy, as is suggested by Tadayon. This is an advantage of the claimed invention because energy conversion causes large losses.

Additionally, as is described in the Application, because the claimed invention uses the heat for cooling the chip, the claimed invention provides a feedback mechanism. Specifically, the energy W_c can be used for other purposes, such as to drive a generator producing electric energy, which is fed back into an electrical power grid, as defined by dependent claim 3.

Furthermore, because the recycled heat is used to cool the microprocessor chip, less external work is required to cool the chip, thereby resulting in less power consumption for the computer system. With this feedback mechanism, as the chip generates more heat, more cooling is provided to the chip (see Application at page 6, line 21 through page 7, line 12). The feedback mechanism is more efficient than the system taught in Tadayon. That is, Tadayon is storing the energy electrically in the battery. There are large energy losses associated with this function. In contrast, the claimed invention teaches using the energy instantaneously in another area of the computer system.

This feature is clearly not taught or suggested in Tadayon.

Moreover, Tadayon does not teach or suggest "*wherein said energy is used to supply an electric power grid*" as recited in dependent claim 3.

That is, the claimed invention teaches using the energy in an alternative area. In contrast, Tadayon merely teaches storing the generated energy in a local battery. The

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Examiner alleges that a battery is considered broadly to teach a power grid. Applicants respectfully submit that even the broadest definition of a battery would not teach or suggest a power grid.

Moreover, Tadayon does not teach or suggest "*wherein said means for directing the heat comprises a solid piece of at least one of copper, silicon, aluminum, which is in thermal contact with said at least one microprocessor*" as recited in exemplary dependent claim 11.

The Examiner concedes that Tadayon does not teach or suggest this feature (see Office Action dated February 18, 2005 at page 4, numbered paragraph 4). The Examiner merely alleges that "[i]t would have been obvious to one having ordinary skill in the art at the time the invention was made to use copper or aluminum or other known thermoconductive materials, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice".

Applicants submit, however, that the materials cited in claim 11 were chosen for a specific purpose. That is, the materials were chosen to provide a heat sink having a sufficient thermal conductance so that there is a minimum temperature difference between the computer chip and the heat sink (see Application at page 9, lines 6-23). Furthermore, claim 11 provides the specific limitation that the means for directing heat is in thermal contact with the microprocessor.

Applicants submit that the features of exemplary claim 11 are not taught or suggested by Tadayon. Furthermore, Applicants submit, for the reasons described above, that it is improper for the Examiner to dismiss these features as merely "obvious" without providing a reference that teaches these features.

Moreover, Tadayon does not teach or suggest "*wherein said means for directing heat comprises at least one of a thermal paste, a silver epoxy, a Au-film, a liquid metal, and an oil*" as recited in exemplary dependent claim 12.

The Examiner does not even mention these features in his rejection of the claims, let alone provide a basis for the rejection of claim 12.

Applicants submit, that the materials cited in claim 12 were chosen for a specific purpose. That is, the materials were chosen to improve the heat transfer from the chip to the

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hot reservoir (see Application at page 10, lines 11-17).

Applicants submit that the features of exemplary claim 12 are not taught or suggested by Tadayon. Furthermore, Applicants submit, for the reasons described above, that it is improper for the Examiner to dismiss these features as merely "obvious" without providing a reference that teaches these features.

Therefore, if the Examiner wishes to maintain his rejection of claims 11 and 12 Applicants respectfully request the Examiner to provide a prior art reference that teaches or suggests the features recited therein.

Therefore, Applicants submit that there are elements of the claimed invention that are not taught or suggest by Tadayon.

B. The Bhatia Reference

The Examiner alleges that Bhatia would have been combined with Tadayon to teach the claimed invention of claims 1, 3, 7, 8, 10-18, 24, 26 and 27. Applicants submit, however, that even if combined, the alleged combination would not teach or suggest each and every feature of the claimed invention.

That is, neither Tadayon nor Bhatia, nor any combination thereof, teaches or suggests an assembly including at least one microprocessor *wherein said mechanical energy is directly used for cooling said at least one microprocessor*" as recited in claim 1 and similarly recited in claims 24 and 27.

The Examiner attempts to rely on Bhatia as teaching a system that utilizes the energy produced by the heat generating component to feed a cooling fan to cool the component. The Examiner does not however, point out which portions of Bhatia he is relying on to support his allegations. The Examiner, however, is clearly incorrect.

That is, nowhere does Bhatia teach or suggest an assembly including at least one microprocessor that includes means for recycling heat generated by at least one microprocessor to energy, wherein the mechanical energy is directly used for cooling the at least one microprocessor. Indeed, the Examiner does not even allege that Bhatia teaches or suggests this feature.

Bhatia uses a thermoelectrical circuit that converts the generated heat into electrical

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energy. The electrical energy is then used to drive the motor of a fan to cool an integrated circuit.

In contrast the claimed invention converts the generated heat into mechanical energy, which is directly used to cool the CPU. That is, the claimed invention re-uses energy without having an extra conversion step of converting the energy into electrical energy. This provides a more efficient system.

Neither Bhatia nor Tadayon, nor any combination thereof, recognized a viable system for directly using mechanical energy to cool a CPU.

Therefore, Bhatia clearly does not make-up for the deficiencies of Tadayon.

Therefore, Applicants submit that even if combined, the alleged combination of references does not teach or suggest each and every feature of the claimed invention.

Therefore, the Examiner is respectfully requested to withdraw this rejection.

C. The Thiesen Reference

The Examiner alleges that Thiesen would have been combined with Tadayon and Bhatia to teach the claimed invention of claims 4-6 and 20-23. Applicants submit, however, that even if combined, the alleged combination would not teach or suggest each and every feature of the claimed invention.

That is, neither Tadayon nor Bhatia nor Thiesen, nor any combination thereof, teaches or suggests an assembly including at least one microprocessor "*wherein said mechanical energy is directly used for cooling said at least one microprocessor*" as recited in claim 1.

The Examiner attempts to rely on the abstract of Thiesen to support his allegations. The Examiner, however, is clearly incorrect.

That is, nowhere in the abstract (nor anywhere else for that matter) does Thiesen teach or suggest an assembly including at least one microprocessor that includes means for recycling heat generated by at least one microprocessor to energy, wherein the mechanical energy is directly used for cooling the at least one microprocessor. Indeed, the Examiner does not even allege that Thiesen teaches or suggests this feature. In fact, the Examiner merely alleges that Thiesen discloses that a heat engine may be used for cooling and power generation.

Therefore, Thiesen clearly does not make-up the deficiencies of Tadayon.

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Therefore, Applicants submit that even if combined, the alleged combination of references does not teach or suggest each and every feature of the claimed invention. Therefore, the Examiner is respectfully requested to withdraw this rejection.

D. The Chrysler Reference

The Examiner alleges that Chrylser would have been combined with Tadayon and Bhatia to teach the claimed invention of claims 4-6 and 20-23. Applicants submit, however, that even if combined, the alleged combination would not teach or suggest each and every feature of the claimed invention.

That is, neither Tadayon nor Bhatia nor Chrysler, nor any combination thereof, teaches or suggests an assembly including at least one microprocessor "*wherein said mechanical energy is directly used for cooling said at least one microprocessor*" as recited in claim 1.

The Examiner does not provide specific support in Chrysler, but merely cites the entire reference of Chrysler to support his allegations. The Examiner, however, is clearly incorrect.

That is, nowhere does Chrysler teach or suggest an assembly including at least one microprocessor that includes means for recycling heat generated by at least one microprocessor to energy, wherein the mechanical energy is directly used for cooling the at least one microprocessor. Indeed, the Examiner does not even allege that Chrylser teaches or suggests this feature. In fact, the Examiner merely alleges that Chrysler discloses that a heat engine may be used for cooling and power generation.

Therefore, Chrysler clearly does not make-up the deficiencies of Tadayon.

Therefore, Applicants submit that even if combined, the alleged combination of references does not teach or suggest each and every feature of the claimed invention. Therefore, the Examiner is respectfully requested to withdraw this rejection.

E. The Hill Reference

The Examiner alleges that Hill would have been combined with Tadayon and Bhatia to teach the claimed invention of claims 4-6 and 20-23. Applicants submit, however, that even if combined, the alleged combination would not teach or suggest each and every feature of the claimed invention.

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That is, neither Tadayon nor Bhatia nor Hill, nor any combination thereof, teaches of suggests an assembly including at least one microprocessor "*wherein said mechanical energy is directly used for cooling said at least one microprocessor*" as recited in claim 1.

The Examiner does not provide specific support in Hill, but merely cites the entire reference of Hill to support his allegations. The Examiner, however, is clearly incorrect.

That is, nowhere does Hill teach or suggest an assembly including at least one microprocessor that includes means for recycling heat generated by at least one microprocessor to energy, wherein the mechanical energy is directly used for cooling the at least one microprocessor. Indeed, the Examiner does not even allege that Hill teaches or suggests this feature. In fact, the Examiner merely alleges that Hill discloses that a heat engine may be used for cooling and power generation.

Therefore, Hill clearly does not make-up the deficiencies of Tadayon.

Therefore, Applicants submit that even if combined, the alleged combination of references does not teach or suggest each and every feature of the claimed invention. Therefore, the Examiner is respectfully requested to withdraw this rejection.

IV. NEW CLAIMS

New claims 28-30 have been added to provide more varied protection for the claimed invention and to claim additional features of the invention. These claims are independently patentable because of the novel features recited therein.

Applicants respectfully submit that new claims 28-30 are patentable over any combination of the applied references at least for analogous reasons to those set forth above with respect to claims 1 and 3-27.

V. FORMAL MATTERS AND CONCLUSION

In view of the foregoing, Applicants submit that claims 1 and 3-30, all of the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance,

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the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Assignee's Deposit Account No. 50-0510.

Respectfully Submitted,


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